



# **SOIL TEMPERATURE AND MOISTURE STUDIES IN MARMOT CREEK BASIN**

**ESTABLISHMENT REPORT**

**Project A-804**

by  
**T. A. Thompson**

**FOREST RESEARCH LABORATORY  
CALGARY, ALBERTA  
INTERNAL REPORT A-5**

**DEPARTMENT OF FORESTRY  
MAY, 1966**

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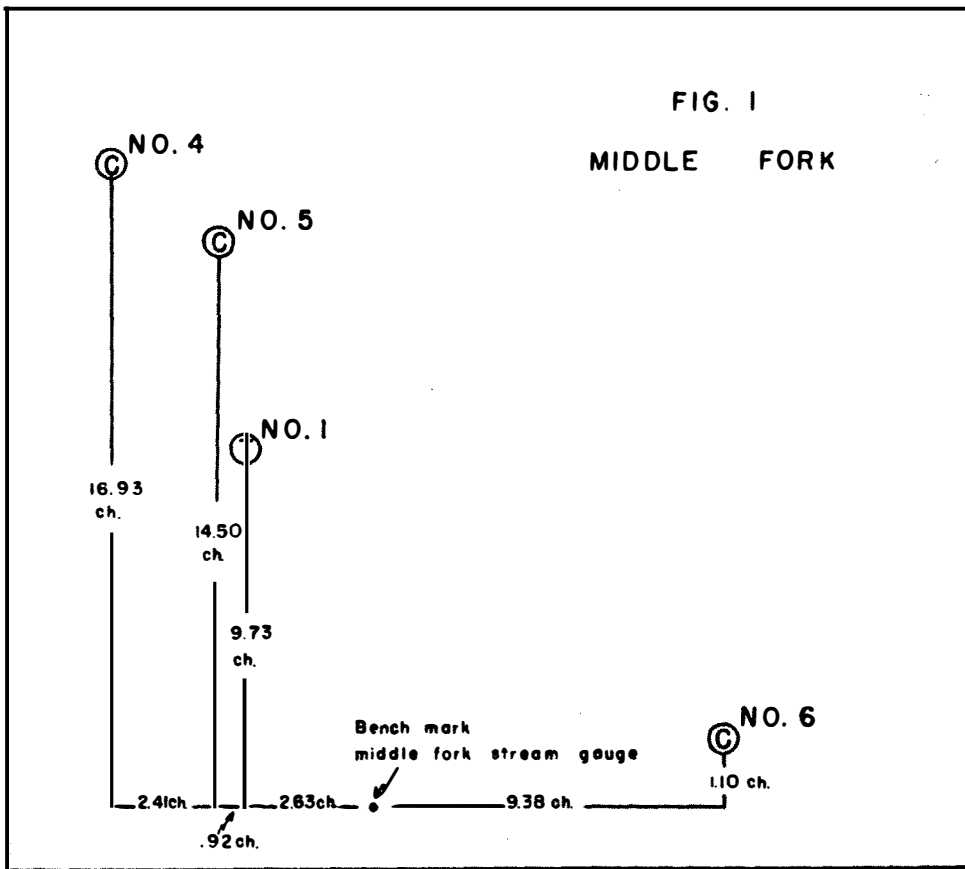
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INTRODUCTION

While excavating soil pits near the Marmot Creek interception plots in July 1963, frost was found on one site while the others were frost free. This observation suggested the need to examine soil temperatures under different forest covers and different aspects to elucidate infiltration-runoff relationships. This would assist the planning of forest cover manipulation to increase water yield or modify timing of runoff. During the summer months also, knowledge of soil moisture regime, according to cover and aspect, is useful.

To assess these factors in an exploratory manner six sites were selected on Marmot Creek Basin and instrumented with fibreglas soil moisture units (Model 351) described by the California Forest and Range Experimental Station (1950). In addition to the moisture sensor these units contain a thermistor which is sensitive to one degree Fahrenheit. Both temperature and moisture are read on the same read-out instrument (Beckman Ohm meter).

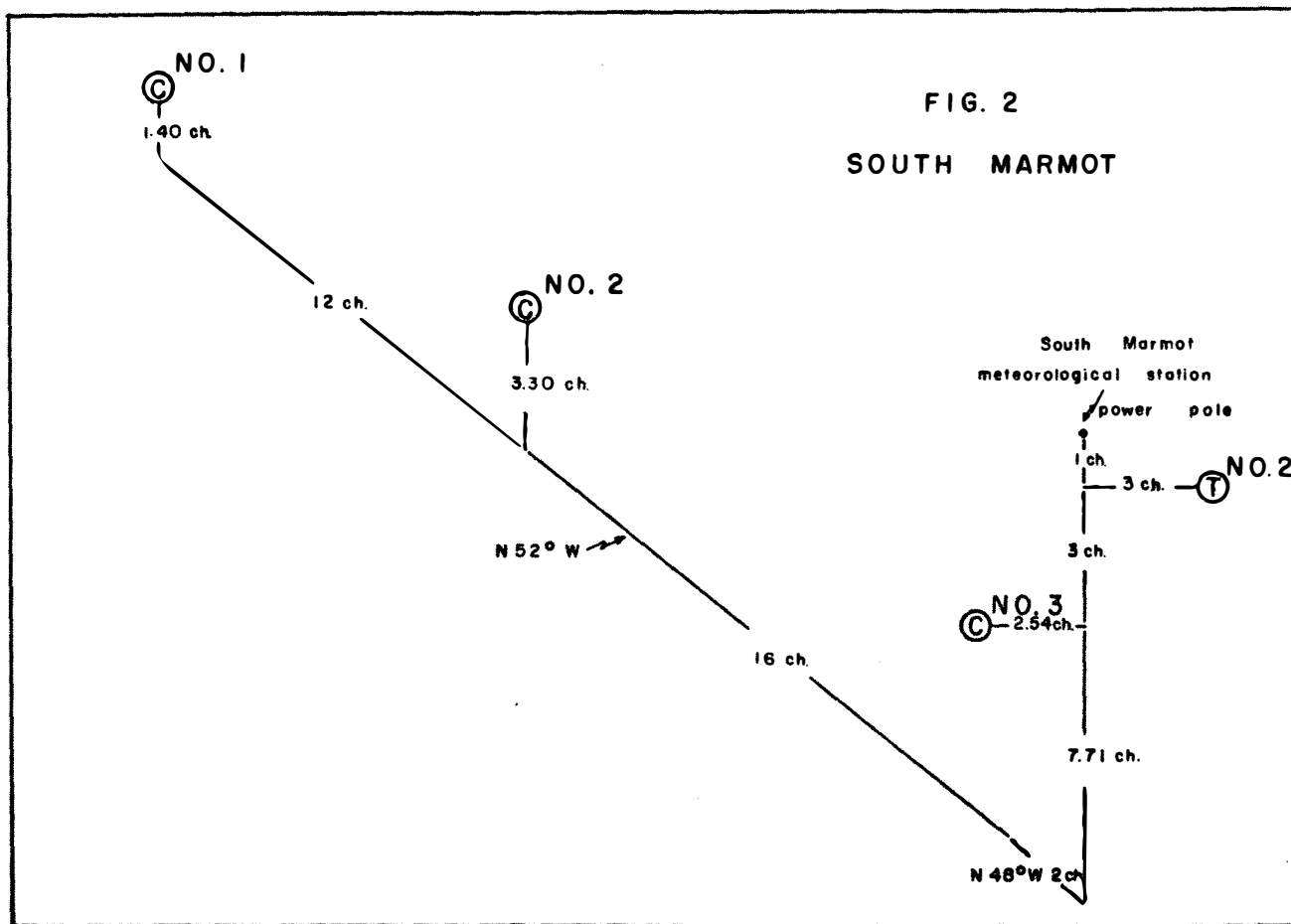
Two further sites were instrumented with Y.S.I. (#44003) thermistor units; one in the fall of 1964 and the second in the fall of 1965.



MARMOT CRE  
PLOT LOCATION

LEGEND

- ⊙ COLMAN PLOT
- ⊙ THERMISTOR PLO



## METHODS

### Plot location and description

The soil temperature-moisture plots are installed in Marmot Creek Basin at the locations shown in Figures 1 and 2. There are three distinct forest covers in the study area: (a) undisturbed spruce-fir forest (b) partially logged-over spruce-fir forest, and (c) dense lodgepole pine forest which followed a fire in 1936. The number, aspect and cover type of each plot are tabulated below.

MARMOT CREEK TEMPERATURE-MOISTURE PLOTS (Colman Units)

Plot No.	Forest cover	Aspect	Installed
1	Uncut eS-aF	North	Nov. 1963
2	Cut-over eS-aF	North	Nov. 1963
3	1P	East	Nov. 1963
4	Uncut eS-aF	South	Nov. 1963
5	Cut-over eS-aF	South	July 1964
6	1P	South	July 1964

eS = engelmann spruce  
aF = alpine fir  
1P = lodgepole pine

Soil temperature plots using Y.S.I. thermistors are also located on Figures 1 and 2.

MARMOT CREEK TEMPERATURE PLOTS

(Y.S.I. Thermistor Units)

Plot No.	Forest Cover	Aspect	Installed
1	grassy bog	East	Nov. 1964
2	1P	Northeast	Aug. 1965

1P = lodgepole pine

Plot Instrumentation and Measurement

A pit, 72 inches deep was dug at each plot. The soil was removed in 1-foot intervals so that it could be replaced in the same position after the sensors were installed.

Ten sensor units were installed in each plot at the following depths: 0, 3, 6, 12, 18, 24, 36, 48, 60, and 72 inches. Unit number 1 was installed at the soil-humus interface and then in ascending order to number 10 at the 72 inch level. A slot was made in the face of the pit with a knife and the Model 351 units were inserted tightly. The soil was replaced as each unit was installed. Y.S.I. thermistors were installed in holes made by a 4-inch spike. Wires from each unit were carried in a conduit to a 10-position switch mounted in an enclosed box on a post 5 feet above ground level (Figure 3). The switch box is fitted with a plug to receive the connector on the read-out instrument (Ohm Meter). A platform nailed on top of the post holds the meter while readings are being taken. Readings are taken weekly and applied to graphs and charts to obtain the final moisture values (Dixon, 1963).

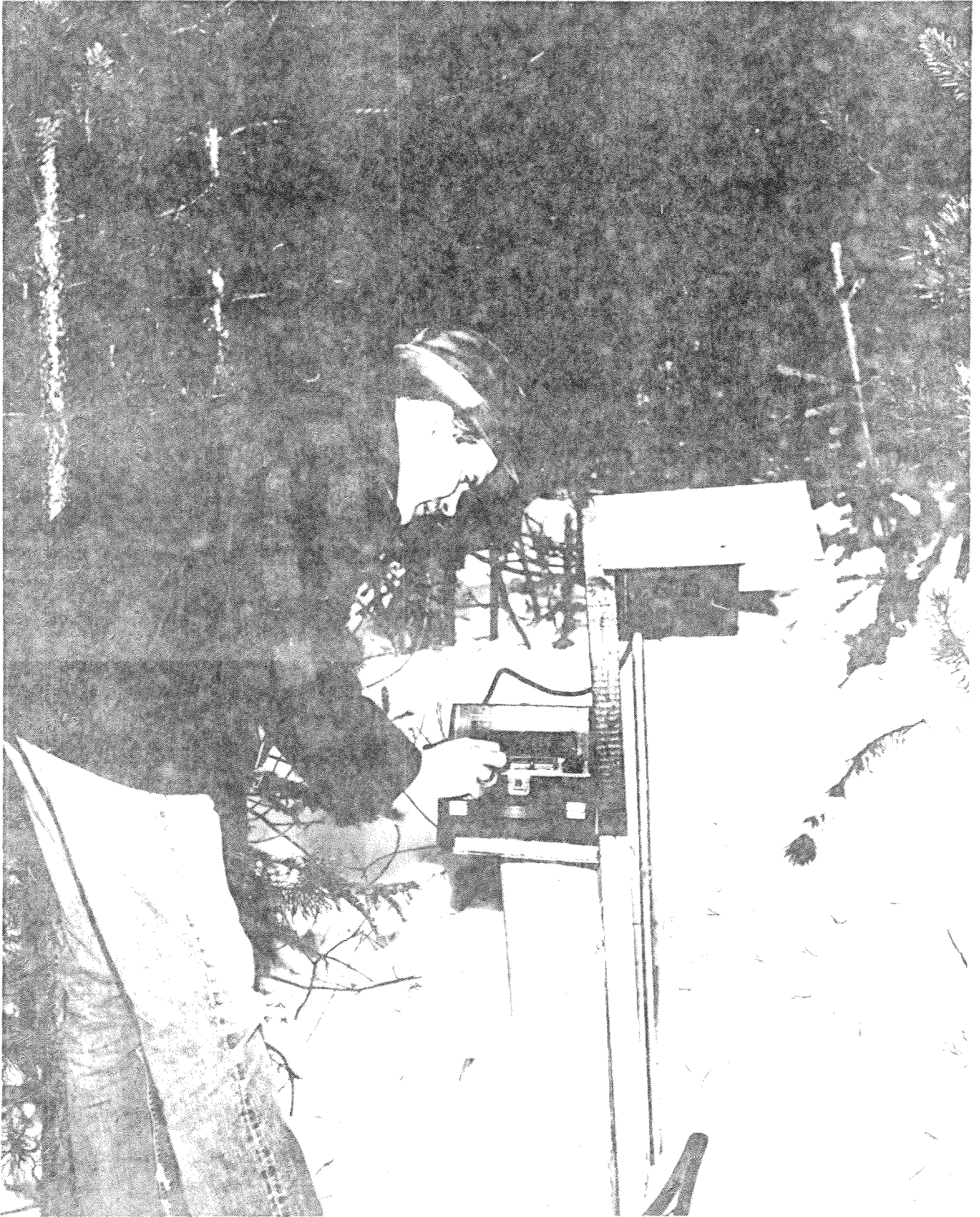


Fig. 3. Soil temperature-mixture plot showing  
Dee on Old meter in position to take  
readings.

REFERENCES

- Anon. 1950. Instruction manual - Fibreglas Soil Moisture Unit Models 351 & 375 also Soil Moisture Ohm Meter Model 300. Reprinted by Berkeley Scientific Division of Beckman Instruments, Inc., from "Manual of Instructions for Use of the Fibreglas Soil Moisture Instrument", Revised edition, April 1950, prepared by California Forest and Range Experiment Station, U. S. For. Service.
- Dixon, G. H. 1963. Temperature Tables for The Colman Ohm Meter. Can. Dept. Forestry, Memo 63-A-16.